



Audit Trail Criteria

- Retail Motor-Fuel Dispensers

NIST Handbook 44



Introduction

- Audit trails accepted in 1989
- Audit trails provide more information than a lead-and wire seal
- Many benefits to users and weights and measures officials



Introduction (continued)

- Same notification requirements apply
- Weights and Measures officials and service personnel must understand
 - Audit trail format
 - Audit trail requirements
 - How to use the information from audit trails



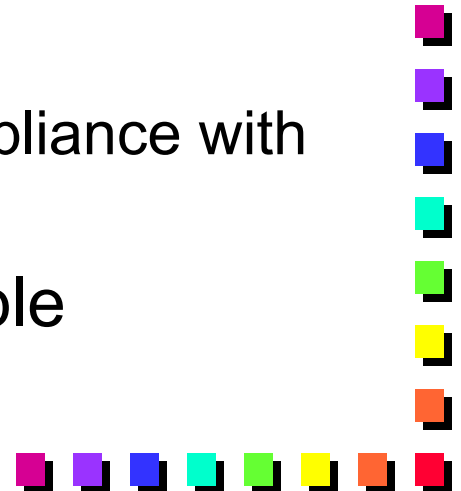
Sealing and Security Seals History

- Before 1979
 - Only lead and wire seals permitted
 - Only adjustments for performance requirements were required to be sealed
- 1979 : Pressure sensitive security seals permitted
- 1985: G-S.8. Added; applied to all electronic adjustable components



Sealing and Security Seals History (continued)

- 1989: G-S.8. & LMD Code S.2.2. Amended
 - Approved means of electronic audit trail recognized
 - Seal features and parameters affecting metrological integrity
 - adjustments affecting accuracy
 - selection of operations that affect compliance with Handbook 44
 - Maintain record of changes to sealable parameters



G-S.8. Provision for Sealing

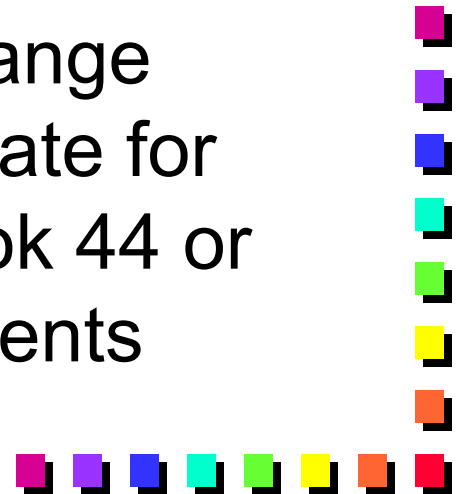
- G-S.8. Recognizes security means other than physical seals
- Alternative forms of security must be an “approved means”
 - Guidelines for “approved means” established for scales and liquid-measuring devices
- Must seal any adjustment that affects the “metrological integrity” of the device

That is.....



Metrological Parameters to be Sealed

- Parameters that can affect the measurement features that have a significant potential for fraud
- Features of parameters whose range extends beyond what is appropriate for device compliance with Handbook 44 or suitability of equipment requirements



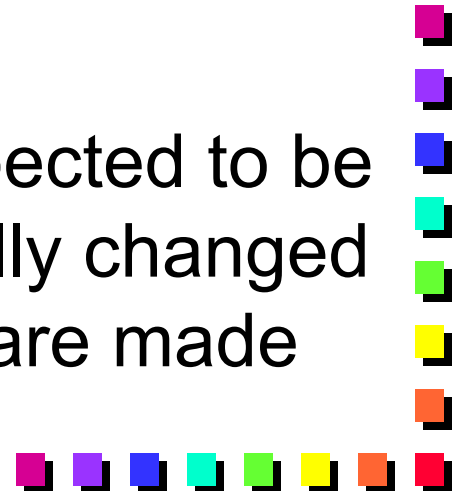
Two Types of Parameters to be Sealed

■ Adjustment Parameters:

- Parameters whose values are expected to change as a result of accuracy adjustments

■ Configuration Parameters:

- Parameters whose values are expected to be entered once only and not generally changed after all initial installation settings are made

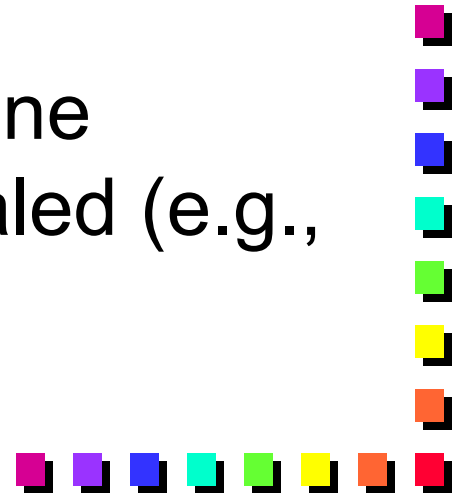


Five Philosophies/Principles for Sealing

1. Need to seal depends on:

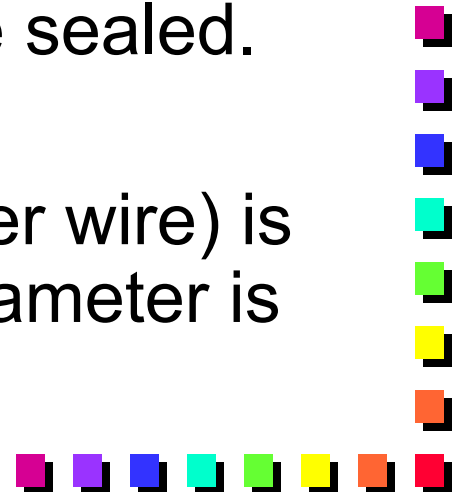
- Ease of facilitation of fraud
- Likelihood that fraud will not be detected

2. Features/Functions used in routine operation do not need to be sealed (e.g., setting unit prices).



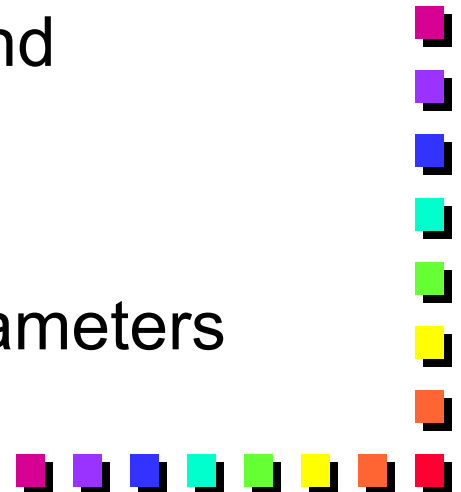
Five Philosophies/Principles for Sealing

3. If selection of parameter would result in obvious error, parameter is not required to be sealed.
4. If menu of parameter options is available, access to menu of options must be sealed.
5. If a physical act (e.g., cutting jumper wire) is required to change parameter, parameter is not required to be sealed.



Typical Parameters and Features to be Sealed

- Defined in NCWM Publication 14
 - scale features and parameters
 - liquid-measuring device features and parameters
 - other device type features and parameters



Liquid-Measuring Device Features and Parameters	
Typical Features or Parameters to Be Sealed	Typical Features or Parameters Not Required to Be Sealed
<p>Calibration Parameters</p> <ul style="list-style-type: none"> Measuring element adjustment (both mechanical and electronic) Linearity correction values 	<ul style="list-style-type: none"> Analog-to-digital converters Quantity division value (display resolution) Double pulse counting Communications
<p>Configuration Parameters</p> <ul style="list-style-type: none"> Measurement units (e.g., gallons to liters) Octane blend setting for retail motor-fuel dispensers Any tables or settings accessed by the software or manually entered to establish the quantity (e.g., specific gravity, pressure, etc.) Density ranges Pulsers Signal pick-up (magnetic or reluctance) Temperature probes and temperature offsets in software Pressure and density sensors and transducers Flow control settings, (e.g., flow rates for slow-flow start, quantity for slow-flow start and stop) Temperature compensating systems (on/off) Differential pressure valves <p>As a point of clarification, the flow control settings referenced above are those controls typically incorporated into the installations of large-capacity meters (wholesale meters). The reference does not include the point at which retail motor-fuel dispensers slow product flow during a prepaid transaction to enable the dispenser to stop at the pre-set amount.</p>	

Benefits of Audit Trails

- Provides industry with an alternative to physical security seals
- Provides more information than physical security seals
- Device owner can use to detect employee tampering



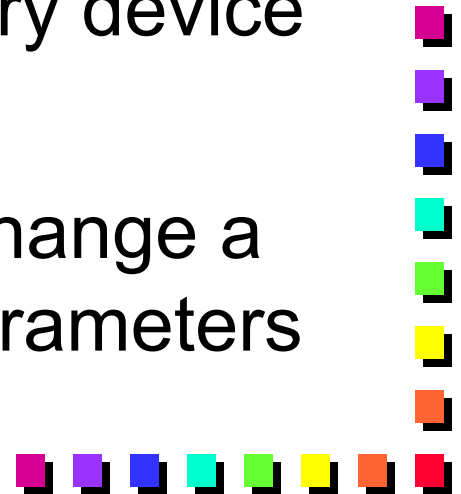
Benefits of Audit Trails (continued)

- Evidence to weights and measures of the number, frequency, and types of changes
- Alerts inspector when investigation is necessary
- Deterrent to fraudulent manipulation of parameters



Definition of “Remote” Device

- Not required for the measurement operation of the primary device or to compute the transaction information (in any mode)
- Not a permanent part of the primary device
- Able to adjust another device or change a device’s sealable configuration parameters



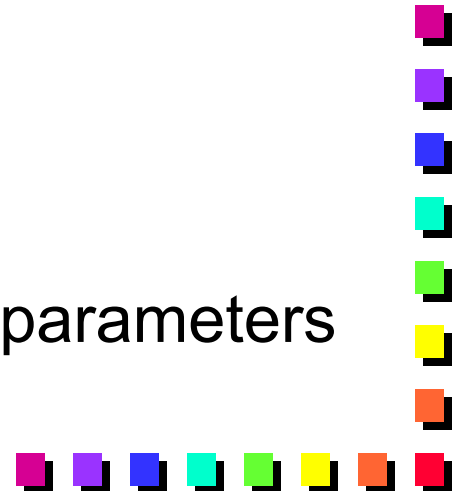
Criteria Defining a System

- The device, component, or main element is essential to the measurement operation of the device or the display of transaction information.
- The device, component, or main element is a permanent part of the device.



Categories of Devices - Overview

- Category 1
 - No remote configuration capability
- Category 2
 - Remote configuration capability
 - Hardware enabling access for remote communication
- Category 3
 - Remote configuration capability
 - Unrestricted access to configuration parameters or adjustments



<i>Table S.2.2. Categories of Device and Methods of Sealing</i>	
<i>Categories of Device</i>	<i>Method of Sealing</i>
<p><i>Category 1: No remote configuration capability.</i></p>	<p><i>Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.</i></p>
<p><i>Category 2: Remote configuration capability, but access is controlled by physical hardware.</i></p> <p><i>Device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.</i></p> <p><i>[Category 2 applies only to devices manufactured prior to January 1, 2005. Devices with remote configuration capability manufactured after that date must meet the sealing requirements outlined in Category 3. Devices without remote configuration capability manufactured after that date will be required to meet the minimum criteria outlined in Category 1.]</i></p>	<p><i>[The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.]*</i></p> <p><i>[*Nonretroactive as of January 1, 1996]</i></p>
<p><i>Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).</i></p> <p>The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode. [Nonretroactive as of January 1, 2001]</p> <p><i>Nonretroactive as of January 1, 2005, all devices with remote configuration capability must comply with the sealing requirements of Category 3.</i></p>	<p><i>An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to ten times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)</i></p>

[Nonretroactive and enforceable as of January 1, 1995.] (Table Added 1993) (Amended 1995, 1998, and 1999)

Table S.2.2. Liquid-Measuring Devices Code

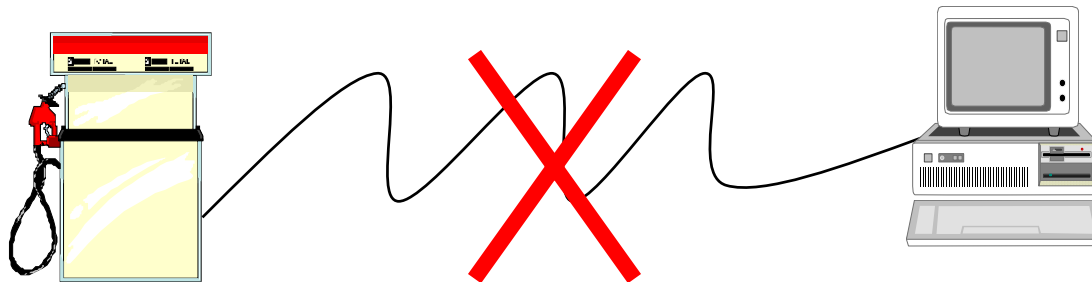


Liquid-Measuring Devices

Category 1

- No remote configuration capability
- Access to adjustments/configuration only at the device
- Sealing:
 - physical seal or
 - two event counters (minimum form of audit trail)

Example: ECR/Console may authorize sales, but
can NOT Remotely Configure Dispenser



ECR/Console

Liquid-Measuring Devices

Category 2

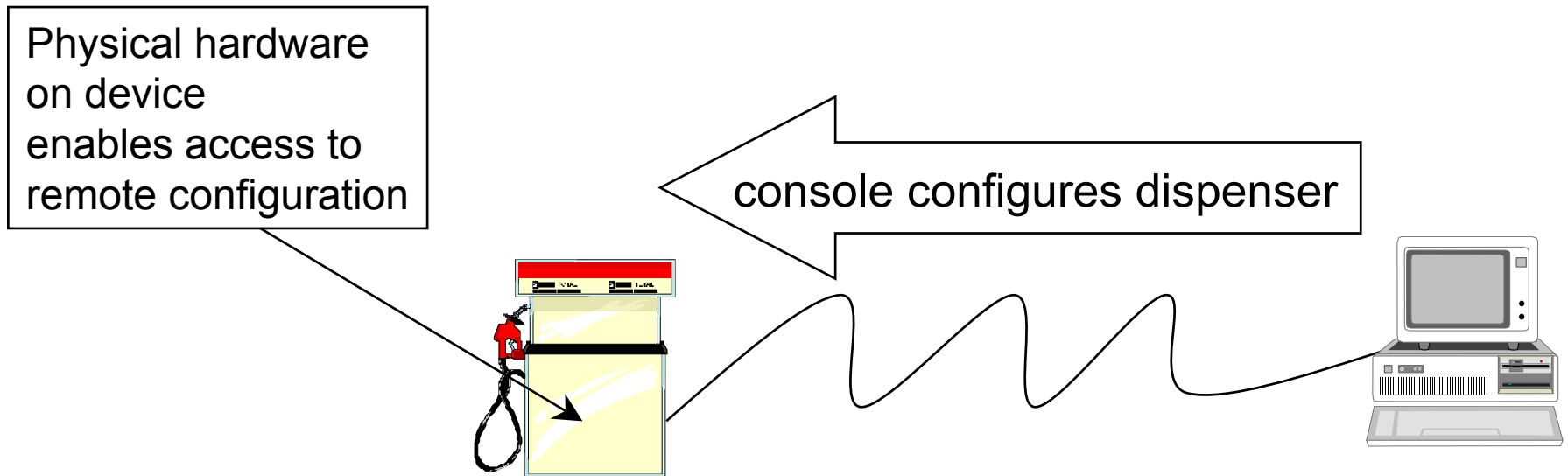
- Remote configuration capability
- Access to remote configuration is controlled by physical hardware on site
- Clear indication when in configuration mode
 - including indication on any recorded representation
- Sealing:
 - hardware enabling access for remote communication sealed using a physical sealOR
 - device receiving parameters sealed with two event counters (calibration and configuration)



Liquid-Measuring Devices

Category 2

Category 2 - Example:



Liquid-Measuring Devices

Category 3

- Remote configuration capability
- Access to configuration parameters or adjustments unrestricted or controlled through software switch (e.g. password)
- Sealing:
 - event logger (or centralized event logger)
 - includes parameter ID, date, time, new value
 - printed copy available on site

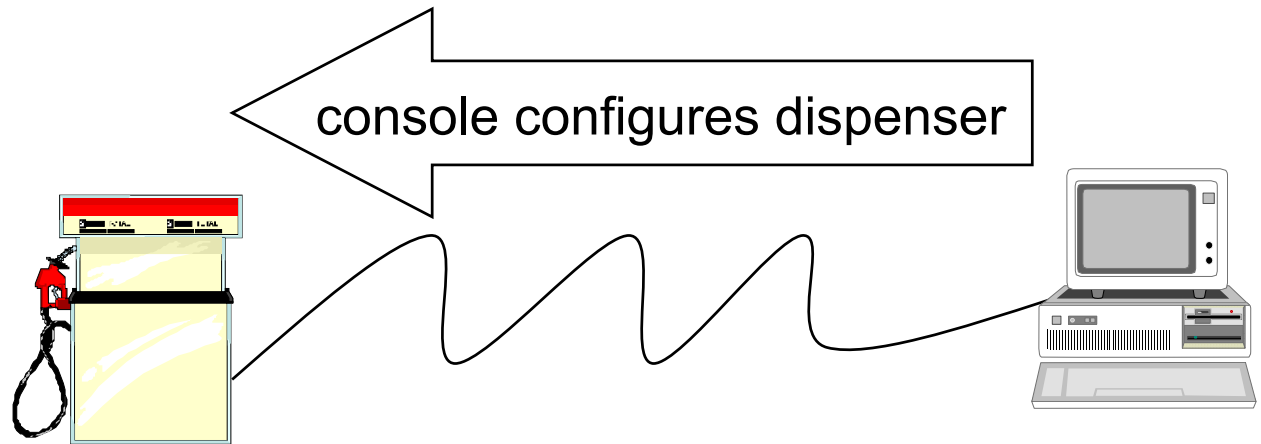


Liquid-Measuring Devices

Category 3

Category 3 - Example:

unrestricted
access
(i.e., anytime)



Liquid-Measuring Devices with Remote Configuration

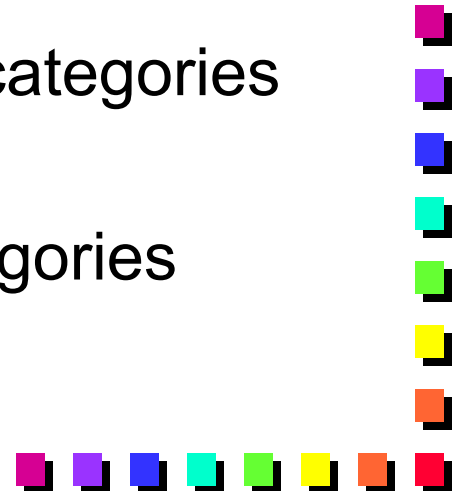
- Nonretroactive as of 2005:
 - All liquid-measuring devices with remote configuration capability must meet Category 3 sealing requirements



Categories of Devices

Other Device Types

- Audit trail requirements for other device types may vary
 - some device types may have more stringent requirements
- Examples:
 - belt-conveyor scales have only two categories
 - Category 1 and 3
 - grain moisture meters have five categories
 - Categories 1, 2, 3, 3a, and 3b



Minimum Form of Audit Trail

- Two event counters:
 - One for adjustment parameters
 - One for configuration parameters
- Capacity of 0 to 999 for each counter
- Counter increments once each time access mode is entered and an adjustment is made



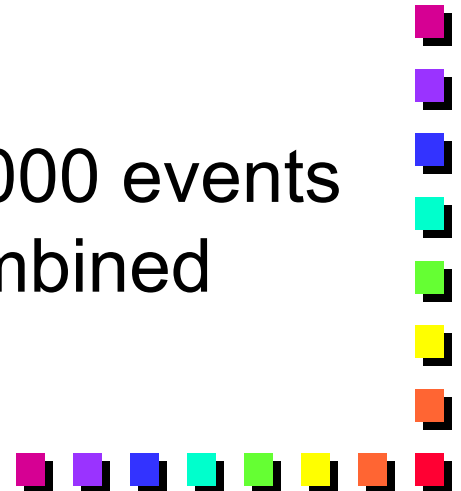
Event Logger

- Required on systems with remote configuration with unrestricted access
- As of 2005, required on all LMDs with remote configuration capability
 - even if access is controlled with physical hardware
- Requires:
 - Event Counter
 - Time
 - Date
 - ID of parameter changed
 - New value for parameter



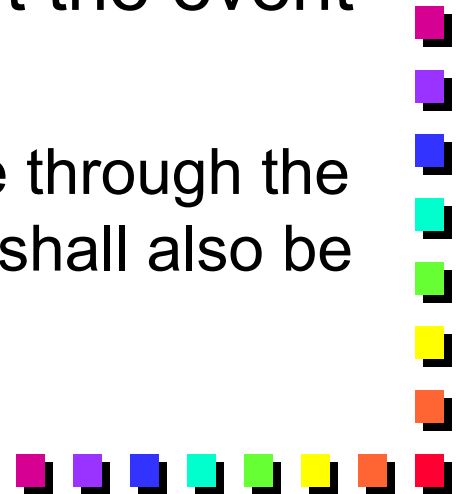
Event Logger (continued)

- Hard copy printout must be available on-site upon demand from the system
- Needs to retain 10 entries per sealable parameter
- Not required to retain more than 1000 events in the logger for all parameters combined



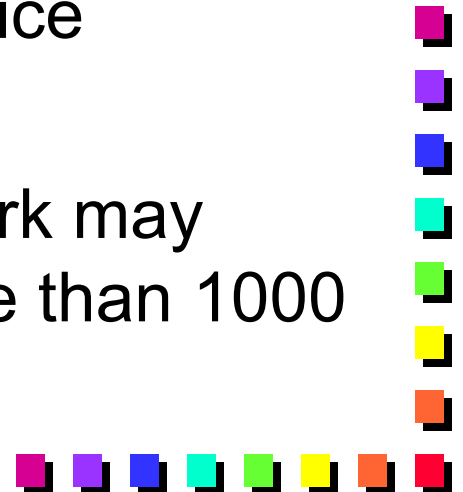
Centralized Event Logger

- Changes through the device sent to and retained in centralized event logger
- It shall not be possible to circumvent the event logger
 - Changes to sealable parameters made through the device (rather than the central device) shall also be recorded in the centralized logger



Centralized Event Logger (continued)

- Devices which have stand-alone operation must have the minimum form of audit trail for the stand-alone operation
- Hard copy of event logger contents must be available on demand from on-site device
- Large numbers of devices on a network may require a logger with capacity for more than 1000 events



Access to Audit Trail Information

General

- Described in the NTEP Certificate of Conformance
- Viewing or printing contents:
 - must be “convenient”
 - must be separate from calibration or set-up mode
 - must not affect normal operation before or after access
 - may be through a supervisor’s mode
 - may require a key to access



Access to Audit Trail Information

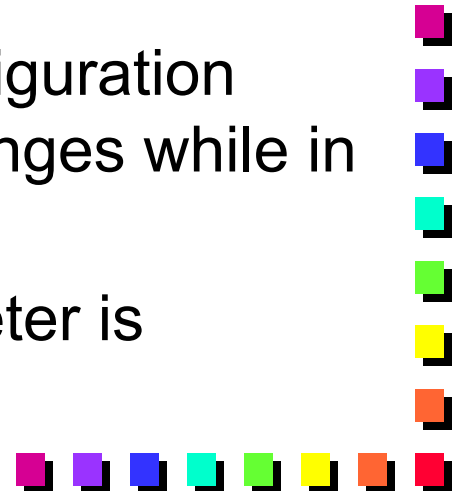
General

- Displayed or printed information shall be readily interpretable by the inspector
- Order of displayed or printed information is most recent to oldest event



General Requirements for Audit Trails

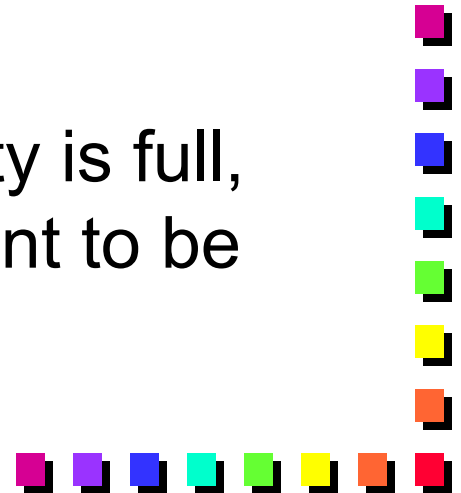
- Adjustment mode accesses only sealable parameters
- An event counter shall be able to count at least 1000 values (e.g., 000 to 999)
 - Increments only once while in the configuration mode regardless of the number of changes while in that mode
 - Counter increments only when parameter is changed



General Requirements for Audit Trails (continued)

- Audit trail data shall be:
 - Stored in non-volatile memory
 - Retained for at least 30 days if power is removed
 - Protected from unauthorized erasure, substitution, or modification

- When the event logger storage capacity is full, any new events shall cause oldest event to be deleted



Physical Seal Compared to Audit Trail

- Physical seal:
 - Broken seal indicates access to the sealed features or adjustments
 - Viewed as a deterrent



Physical Seal Compared to Audit Trail (continued)

- Audit Trail:
 - Indicates if changes were made to adjustments or to configuration parameters
 - Indicates number of times the changes were made
 - Record of changes serves as a deterrent
 - Retains the last values of electronic adjustments or octane blend settings on event logger

